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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,062	03/31/2004	Frank A. Baiocchi	3-4-42-11	5729

7590 07/13/2005
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EXAMINER

CHAUDHARI, CHANDRA P

ART UNIT PAPER NUMBER

2891

DATE MAILED: 07/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/814,062	BAIOCCHI ET AL.	
	Examiner	Art Unit	
	Chandra Chaudhari	2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 20-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 June 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>March 31, 2004</u> | 6) <input type="checkbox"/> Other: _____ |

Applicant's election with traverse of claims 1-19 in the reply filed on May 2, 2005 is acknowledged. The traversal is on the ground(s) that the designation recited is arbitrary. This is not found persuasive because according to MPEP 806.05(f), only one-way distinctness needs to be shown.

The requirement is still deemed proper and is therefore made FINAL.

Claims 9-10 are objected to because of the following informalities:

Claim 9 should probably depend on claim 7 or 8.

Appropriate correction is required.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3-5, 12-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Kim - US 2002/0053699.

Kim (Figs. 4A-4D and text in paragraphs 34-52) discloses the invention by forming a metal oxide semiconductor device by forming epitaxial layer 31b on at least a portion of semiconductor substrate 31a, trenches 35, diffusion regions 36a, polysilicon filler material 36b, insulating layer 42, laterally spaced source and drain regions 47 and 48.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 7-11, 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim and Darwish - US 6,084,264.

Kim is applied as above and does not disclose implanting boron to form the diffusion region nor cleaning the sidewalls of the trench, nor growing an impurity-rich on the trench sidewalls, nor the trench parameters. Darwish (Figs. 5A-5I, 11A and text in col. 5, line 54 to col. 6, line 42 and col. 7, lines 33-41) teaches to implant boron to form the doped regions around the trenches and driving in by heating.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the diffusion regions by implanting boron and heating as taught by Darwish in Kim's process as being an art recognized equivalent to Kim's doping by boron nitride (also, doping by growing an impurity-rich oxide is reasonable to one of ordinary skill in the art as being an art recognized equivalent). Cleaning the sidewalls of the trenches is reasonable to one of ordinary skill in the art to remove native oxide for improved dopant diffusion to lower resistivity. The trenches being spaced about 5 microns apart and being formed less than about 1.2 microns in width appear reasonable and may be optimized from Kim since the trenches are formed partially into the epitaxial layer. In addition the trenches of Darwish are also formed partially into the epitaxial layer.

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Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim and applicant's admitted prior art.

Kim is applied as above and does not disclose the at least one trench comprising a v-groove. Applicant's admitted prior art on pages 2-3 teaches that v-grooves or trenches may be formed when forming a semiconductor structure with an epitaxial layer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a v-groove as taught by applicant's admitted prior art in Kim's process depending on the resistance and aspect ratio required for the device.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Hshieh - US 5,981,344 describes a trench device.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chandra Chaudhari whose telephone number is 571-272-1688. The examiner can normally be reached on Mon - Fri (9:00-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chandra Chaudhari

Primary Examiner

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Chandra Chaudhari

July 8, 2005